

No. 6. — *Reports on the Scientific Results of an Expedition to the
Rain Forest Regions in Eastern Africa*

VI

Nematoda

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In the course of his 1933–1934 expedition to Kenya Colony and Uganda, as a Fellow of the Guggenheim Memorial Foundation, Mr. Arthur Loveridge collected a small quantity of helminthological material. Subsequently in the course of making a systematic study of the food habits of the many reptiles collected, Mr. Loveridge has encountered many other instances of parasitism. Where parasites uncovered in this way have proved of special interest, it has been possible to examine the alimentary tracts of a large series of alcohol or formalin preserved hosts and in this way to secure a much more useful collection than could be obtained in the field. Although some of the worms collected many months after their death are not preserved in as effective a manner as they might have been if secured alive, most of them are still suitable for study. This method of gathering nematodes has the special advantage of permitting a very thorough inspection of the gut contents. As a result, the taxonomically all-important males, elusive because of their minute size and relative rarity, can usually be detected.

A new genus and several new species of nematodes are described in this paper. The collection also contained a number of forms that have been previously observed and described. Only in one instance (see p. 361 of this paper) is their occurrence in a new host or locality deemed of sufficient helminthological interest to warrant a special account; however, these new records are incorporated in Mr. Loveridge's herpetological papers, under the caption "parasites."

The type material of the new species described in this paper are deposited in the Helminthological Collection of the Museum.

SPIRUROIDEA

PARASPIRURA MABUYAE gen. et sp. nov.

Host: *Mabuya brevicollis* Wiegmann.

Location: Stomach (free in lumen).

Locality: Kibwezi or Tsavo, Kenya Colony.

This worm is represented by 9 male and 12 female specimens. The translucent white body is fairly straight in the preserved state, tapering gradually towards the extremities, and relatively slender. Cuticular striae conspicuous, $4\ \mu$ apart. The head, about $60\ \mu$ wide, is not set off from the rest of the body by a constriction or inflation of the cuticle. Two small, simple, lateral lips or pseudolabia, each bearing towards its

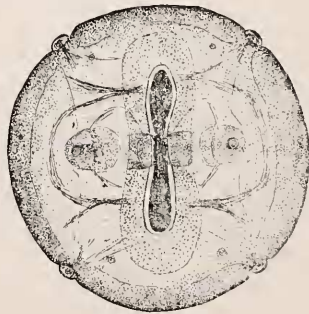


Fig. 1. *Paraspirura mabuyae*. Frontal view of head.

base two pairs of papillae of which the inner are minute, the outer fairly large and prominent; in addition, somewhat anterior to the papillae in the median field of each lip is a relatively large circular amphid. Cuticular elevations in the form of narrow membranous shields (? interlabia) form a bridge between the lips dorsally and ventrally. On the internal face of each lip near its apex is a minute tooth-like projection, and behind this is a serrated edge that recalls the denticular ridges of some species of *Abreviata*. From the frontal view (Fig. 1) the oral aperture is seen to be dorso-ventrally elongated with a pronounced constriction in the middle. The lips are not superficially lobed though lateral and dorsal views of the head (Figs. 2 and 3) show grooves and cuticular flanges on their internal faces.

Buccal cavity cylindrical, 45 to $55\ \mu$ long and about $30\ \mu$ wide, with delicate, lightly cuticularized walls.

Cervical papillae acicular, symmetrical, located in front of nerve ring which encircles the middle of the muscular part of oesophagus. Excretory pore conspicuous, about 0.10 mm. behind nerve ring.

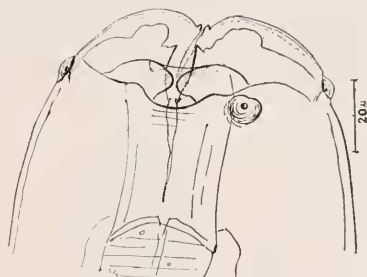


Fig. 2. *Paraspirura mabuyae*. Dorso-ventral optical section.

Male. Length 12.6 to 11 mm., maximum width near equator 0.33 to 0.37 mm. Total length of oesophagus 4.03 to 5.2 mm., of which the anterior muscular part measures 0.23 to 0.27 mm. Caudal alae wide,

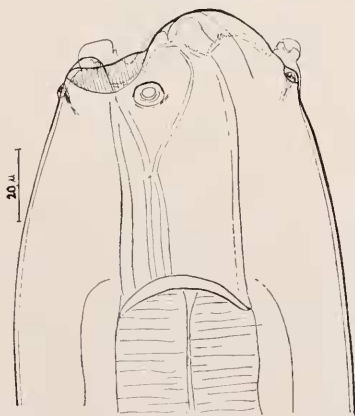


Fig. 3. *Paraspirura mabuyae*. Lateral optical section.

becoming confluent with body contour about 0.2 mm. in front of cloaca and extending posteriorly to tip of tail. Cuticle on venter ornamented with a delicate pattern of linear and small tessellated markings.

Cloacal aperture salient, and large. Tail 0.23 to 0.25 mm. long. There are four pairs of lateral stalked papillae equidistantly spaced in front of anus. A median papilla with relatively large end-organ is found on the anterior rim of the cloaca. Post-anally there are five pairs of papillae: the first pair are sessile and situated towards the median line; a larger pair of stalked papillae near the middle of the tail; between the

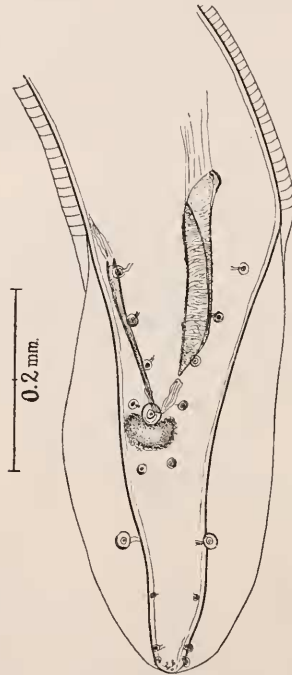


Fig. 4. *Paraspirura mabuyae*. Tail of male; ventral view. The cuticular ornamentation is not represented in the figure.

last mentioned and the tip of the tail is a pair of very small lateral sessile papillae; adorning the tip of the tail are two pairs of lateral papillae with short peduncles in addition to the minute pores of the caudal glands. Spicules unequal and dissimilar; left spicule is the more robust and measures 0.23 to 0.24 mm. and about 0.035 mm. wide in the middle of the shaft; it is superficially marked with strong irregular lines. Right spicule thinner, more lightly cuticularized, measures

0.16 to 0.18 mm. by 0.015 mm. broad. Gubernaculum, apparently v shaped or triangular in ventral view, measures about 0.060 mm. but lightly cuticularized and consequently difficult to define.

Female. Length 17 to 21 mm.; maximum width 0.40 mm. Muscular oesophagus 0.35 to 0.37 mm.; glandular oesophagus 4.3 to 5.4 mm. Body tapers posteriorly to form a gracefully curved tail with rounded end provided with two minute spike-like papillae. Anus slightly

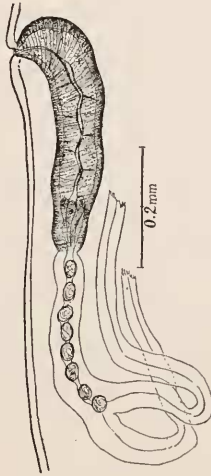


Fig. 5. *Paraspirura mabuyae*. Female genitalia from dissection.

salient, 0.37 to 0.41 mm. from extremity. Vulva with slightly tumid lips situated at the beginning of the posterior third or fourth of the body, 4.1 to 6.3 mm. from the extremity. Vagina directed posteriorly. Ovejector thick-walled, 0.4 mm. long, continues into a short (0.25 mm.) so-called common trunk formed from the union of the two uteri which soon bend antieriad then diverge to run in opposite directions. Eggs rounded oval, with thick smooth shells averaging 42μ by 33μ ; embryonated when discharged.

SYSTEMATIC POSITION

If, in spite of the practical difficulties that may be connected therewith, we regard the nature of the buccal cavity and the structure of the

lips with their associated sense organs as representing the characters of primary taxonomic significance, and we employ the key to the families of Spiruroidea which Chitwood and Wehr (1934, p. 312) have constructed chiefly on the basis of cephalic structures, the species described above must be classified among the Spiruridae. On further investigation it is found that the species shows closest affinity with either the Spirurinae (Railliet, 1916) or the Habronematinae Chitwood and Wehr, 1934, depending upon whether we are to interpret the narrow flange-like membranes that connect the lips in the dorsal and ventral fields as interlabia.

With the exception of *Hedruris*, whose relationship with the present form is evidently a distant one, there is no genus in the Spiruridae with representatives recorded in reptiles. Leaving out of consideration the difficult question of the interlabia, I am inclined to attribute our species to the Spirurinae chiefly on account of several similarities that it has with certain species of *Spirura*. Thus, the constriction of the oral rim is comparable with that of *S. rytiplerites* (cf. Chitwood and Wehr, 1934, p. 297) and *S. michiganensis* Sandground, 1934, and the structure of the female genitalia and male caudal extremity is very similar to that described for *S. talpae* by Stefanski (1934).

Our species must, however, be generically differentiated from *Spirura* on account of the absence of labial lobes, the presence of labial teeth and the shape of the buccal cavity.

PARASPIRURA gen. nov.

Spiruridae. Two small lateral lips each bearing two pairs of papillae submedially towards the base and a larger circular amphid in the median line. Minute apical tooth and dentigerous ridges on inner labial face; membranous flanges (? interlabia) between the lips. Mouth dorso-ventrally elongated. Buccal vestibule cylindrical with lightly cuticularized walls. Oesophagus plainly divided into muscular and glandular parts. Male with wide caudal alae and cuticular ornamentations on ventral surface. Four pairs pedunculate and a single median preanal papillae; five pairs postanal papillae. Spicules unequal and dissimilar. Gubernaculum present. Vulva post-equatorial; Oviparous.

Type species *P. mabuyae* in Lacertilia.

ABREVIATA (POLYDELPHYOPTERA) POICILOMETRA sp. nov.

Host: *Cercopithecus mitis kibonotensis* Lönnberg.

Locality: Ngatana, Kenya Colony.

The material consists of four females and a single male, robust in form with slight attenuation towards the truncated head and a more sharply pointed tail. Delicate, transversely striated cuticle loosely wrinkled in cephalic region where it may be partially or wholly reflected over the lips. Labial armature of denticles similar to that described by Ortlepp (1926) for *Physaloptera caucasica*, consisting of a

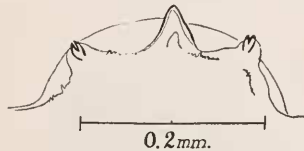


Fig. 6. *Abreviata (P.) poicilometra*. Inner face of a lip.

prominent triangular apical tooth with a single small membranous structure projecting from its internal base, two split or chela-like teeth on submedian edge, and several denticular ridges on the inner face visible only on separating the lips. (Fig. 6.)

Measurements of *A. poicilometra* in millimeters.

	Male	Female
Length	35	38-63.
Equatorial width	1.4	1.6
Cervical papillae from antr. end.	0.58	0.7
Glandular oesophagus	0.4	0.4
Muscular oesophagus	4.4	6.0
Tail	1.9	1.5
Vulva to antr. end.		10.3
Eggs		0.049 x 0.038 average

FEMALE GENITAL SYSTEM

Vulva inconspicuous externally. There is a long, narrow vagina which gradually dilates into a spindle-shaped egg-chamber which, at its broadest point, measures 0.37 mm. The posterior end of the egg chamber again narrows to form the so-called common trunk, which receives the uteri. In three specimens that were dissected, the number

of uteri as well as their mode of union with the common trunk showed the following variations: In the longest female (63 mm.) there were ten uteri arising by irregular dichotomy, six uterine branches uniting in pairs to form one arm of the common trunk, and four uterine branches pairing up to form the second arm. (Fig. 7B.) In the second

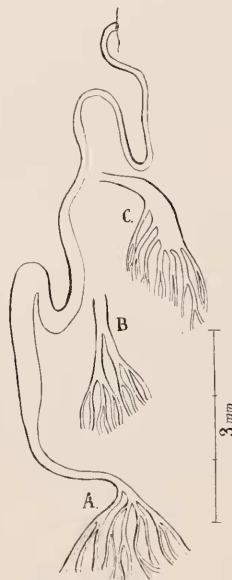


Fig. 7. *Abreviata (P.) poecilometra*. Dissections of the genitalia of three females showing variation in the number and mode of union of the uteri with the common trunk.

specimen (Fig. 7A) the genitalia consisted of 13 uteri, the common trunk first giving off an arm that divides into 3 branches and further back the other arm splits into three very short branches, of which the inner divides dichotomously into 4 uteri while the remaining two each give rise to three uteri. In the smallest example of the species (38 mm.) the individual uteri were intertwined in a manner which did not permit determination of their exact number. There were certainly more than 14 uterine tubes uniting by twos and threes to form seven arms which individually emptied into the base of the common trunk as shown in figure 7C.

MALE GENITAL SYSTEM

The "bursa" is lanceolate in shape, measuring 2.3 mm. in length and 1.2 mm. at its widest point. Its ventral surface shows the usual cuticular ornamentation. The long stalked lateral papillae are arranged in pairs in front of and behind the anus. Three sessile papillae

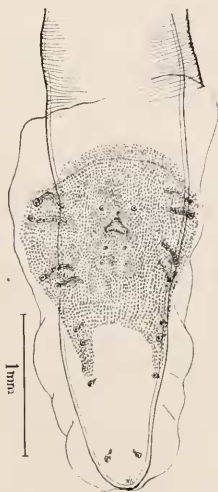


Fig. 8. *Abreviata (P.) poecilometra*. Caudal extremity of male from ventral aspect.

arranged at the points of a triangle mesially in front of the anus. Two median, sessile pairs of papillae immediately post-anal. Four pairs of lateral papillae with short peduncles behind the anus in positions illustrated in figure 8. Spicules unequal and dissimilar: left thin and flexible measures 2.8 mm. in length; the right is of more substantial structure but as it was partially extruded it was not in a favorable position for measurement; approximately its length is around 0.3 mm.

SYSTEMATIC POSITION

As it was defined and treated in the comprehensive revision by Örtlepp (1922), the genus *Physaloptera* Rudolphi was one of the largest and taxonomically one of the most unwieldy of the genera of parasitic

nematodes. Many of the better known species in the genus are known to display great ranges of variation effecting many of the criteria that have been utilized for specific differentiation. Even though Ortlepp reduced many of the species to synonymy, there can be no doubt that many ill-differentiated species are still retained in the catalogue. A critical revision of the group, undertaken as soon as information on developmental morphology secured from cross-infection life-history experiments is available, will probably reveal that many species erected mainly on the basis of host occurrence should be eliminated. Although it was not undertaken with a view to eliminating the spurious species that have accumulated, the most valuable of recent contributions to the taxonomy of the Physaloptera is that of Schulz (1927) which, being published in Russian in a not often available "Festschrift," has not received the attention it merits. To subdivide and regroup the species of Physaloptera (s.l) Schulz has employed a so-called Principle of Taxonomic Co-efficients, a device which apparently loses nothing because of its purely pragmatic purpose. The genus is divided primarily on the dentation of the lips into three genera, each of which is secondarily separated into subgenera on the basis of the uterine branching in the female.

Classified on the basis presented by Schulz, the species described in the present paper will be assigned to the genus *Abreviata* (Travassos) emend Schulz, which is characterized by the presence of an apical tooth, dorsal and ventral submedian teeth, and with or without denticular ridges on the internal face of the lips. It will further be placed in the subgenus *Polydelphyoptera* on account of its multiple uteri. Schulz assigned only one species, *A.(P). capensis* Ortlepp, 1922 from the South African rodent, *Xerus capensis*, to this subgenus. A questionable second species of the subgenus is *Physaloptera joyeuxi* Gendre, 1928 from *Phacochoerus africanus*. Our species is also to be assigned here. The outstanding differential feature in the male is its sixth pair of post-anal papillae, other species usually carrying only five pairs. The most interesting feature of the species is the surprising variation displayed in the number and mode of origin of the uteri. In the first specimen dissected (Fig. 7 A) the uteri are identical with that described for *A.(P). capensis*; the uterine complex in the second and third of our dissected specimens appears to be unique among polydelphous forms thus far described among species of the group.

STRONGYLOIDEA

OSWALDOCRUZIA LOVERIDGEI spec. nov.

Host: *Siaphos kilimensis* Stejneger (Scincidae).

Locality: Mt. Mbololo, Taita, Kenya.

The range of measurements of the 8 male and 4 female worms, taken from the stomachs of 3 of 5 specimens of the host examined, are as follows:

	Male	Female
Length	3.5-4.1	5.9-7.5
Maximum breadth	0.08-0.09	0.1-0.15
Antr. end to nerve ring	0.15-0.16	0.19-0.21
Antr. end to excret. pore	0.19-0.25	0.26-0.28
Length of oesophagus	0.27-0.30	0.36-0.38
Length of tail		0.23-0.25
Length of spicules	0.19	
Head to vulva.		4.84-4.9
Size of eggs in uteri		76-84 μ x 42-48 μ

The specimens are well extended but the state of preservation of some specimens is not all that can be desired. Perhaps for this reason considerable differences are observed in the cuticular inflation of the

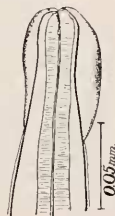


Fig. 9. *Oswaldocruzia loveridgei*. Anterior extremity of a male with maximum development of cephalic inflation.

cephalic region. In some worms this inflation is hardly perceptible while in others it is conspicuous and extends for 65 μ to 70 μ in both sexes. In several specimens the cuticle, including that of the cephalic inflation, is devoid of cross striations or other markings; in others a faint striation is to be seen. Occasionally the cephalic inflation is uniformly marked with fine or coarse granulations (Fig. 9). Variations

in the appearance of this structure consequently appear to be of little taxonomic significance.

Narrow lateral alae may be found in the anterior portions of the body in both sexes. Cervical papillae, and in the male, prebursal papillae were not observed.

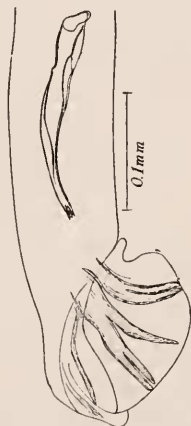


Fig. 10. *Oswaldocruzia loveridgei*. Lateral view of caudal region of male.

As illustrated in Fig. 10, the arrangement and form of the bursal rays are characteristic of the genus, but the terminal digitations of the dorsal ray, identical in all specimens examined, appears to be distinctive of the species. The golden yellow spicules are about 15μ wide in the middle and are split distally into 4 splinter-like processes which spread out like the ribs of an open fan (Fig. 13) when the spicule is partially extruded from the cloaca.

No special peculiarities were found in the females.

Although the records do not indicate that members of this genus display any high degree of host specificity, few of the fourteen or more presumably distinguishable species of *Oswaldocruzia* have been described from reptiles. Among these are *O. agamae* Sandground, 1929, *O. malayana* Baylis 1933 and *O. brasiliensis* Lent and Freitas, 1935. The present species seems to show the closest resemblance to *O. brasiliensis*, recently described from a Brazilian snake, *Drymobius bifossatus*. This is especially true when size is considered, but since con-

siderable differences in size may be expected in the same species associated with different hosts (Harwood, 1932) little stress is to be attributed to the fact that the species here described is among the



Fig. 11. *Oswaldocruzia loveridgei*. Terminal digitation of dorsal ray; highly magnified.



Fig. 12. *Oswaldocruzia loveridgei*. Spicule in its sheath drawn from dorsal aspect.



Fig. 13. *Oswaldocruzia loveridgei*. Extremity of exserted spicule; highly magnified.

smallest thus far recorded in the genus. The view that the species is new is based more on a consideration of the form of the spicules and the terminal branching of the dorsal ray.

OXYUROIDEA

PHARYNGODON MABUYAE sp. nov.

Host: *Mabuya varia varia*.

Location: rectum.

Locality: Mt. Elgon, Uganda.

This species, comprising some thirty male and female specimens, was found in two of three examinations of the host. As the following

table of measurements will show, the species is somewhat larger than those previously described in the genus. In all features, other than those mentioned below, our form closely resembles *Pharyngodon lacvicauda* as described by Seurat (1914), but after having been com-



Fig. 14. *Pharyngodon mabuyae*. Male viewed from ventral aspect.

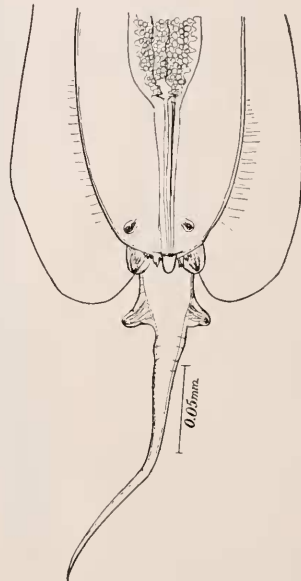


Fig. 15. *Pharyngodon mabuyae*. Caudal extremity of male from ventral aspect under higher magnification.

pared with the descriptions of all the species recognized by Spaul (1926) and the four species that have subsequently been added to the genus, it is believed to represent a distinctly new species.

Measurements in millimeters

	Female	Male
Length	6.6-7.1	2.0-2.3
Maximum width	0.465	0.25
Length of oesophagus including bulb.	0.65-0.69	0.43-0.46
Antr. end to nerve ring	0.46-0.5	0.34

Measurements in millimeters

	<i>Female</i>	<i>Male</i>
Antr. end to excret. pore	0.63-0.85	0.63
Antr. end to vulva	0.69-0.87	
Anus to postr. extremity	0.65-0.71	0.18-0.21
Intervals between striae	11 μ	7 μ
Eggs; length x breadth	170-178 μ x 45-50 μ	

Lateral alae are to be found in both males and females arising from the mid-oesophageal region. In the female the alae are visible in the anterior part of the body as narrow bands, only slightly elevated above the cuticular surface. In the male the alae broaden gradually



Fig. 16. *Pharyngodon mabuyae*. Egg drawn to show bi-polar opercula.

from before backwards, but they only become conspicuous in the posterior sixth of the body where they flare out into broad wings extending to the level of the cloaca. There are the usual three pairs of papillae. The preanal pair are smallest; the paranal and basal-caudal pairs are larger. Neither from the ventral nor the lateral view of the body can one see any cuticular expansion that can be regarded as a caudal ala or bursa.

Between the paranal papillae and projecting over the ventral border of the cloaca there arises a bluntly conical elevation which is flanked on either side by a serrated cuticular ridge or row of irregular cuticular spines. This structure is not described for other species of *Pharyngodon* but it is found in a number of species of the related genus *Thelandros*.

A slender, poorly chitinized spicule, measuring about 85 to 90 microns in length, is apparently present. However, it is so poorly definable that one cannot be sure of its existence.

For a discussion of the systematic relations of *P. mabuyae* see below.

THELANDROS SEURATI sp. nov.

Host: *Acontias percivali* Loveridge (Scincidae).

Location: Rectum.

Locality: Taita, Kenya Colony.

About a dozen specimens, of which only two were males, were found in the rectum of the above named host on two occasions. The females are all fully mature and contain several hundreds of eggs. The chief measurements of the species are as follows:

	<i>Female</i>	<i>Male</i>
Length	4.4 -4.75	2.8 -2.85
Maximum width (rather flattened)	0.60	0.35
Nerve ring to antr. end.	0.18	0.17
Excret. pore to antr. end.	?	1.1
Length of oesoph. including bulb	1.2 -1.27	0.75-0.80
Length of tail	0.25-3.20	0.10
Length of spicule		0.12
Antr. end to vulva	1.95-2.5	
Eggs (length x width)	0.076 x 0.040	

The worms are usually well preserved, turgid forms with conspicuous annulations which in the oesophageal region are about 25μ apart in the males and 30μ apart in females. Head set off from body by a well defined constriction. The three lips are plainly bilobed. Amphids are represented by fine tubules penetrating the latero-ventral lips towards the dorsal angle. Cephalic papillae are too small to be accurately described. There is a distinct buccal cavity in the form of a shallow saucer-like depression with a conical base. The broad lateral fields are composed of a small number of relatively large quadrate cells whose spherical nuclei are about 25μ in diameter. Lateral alae are not seen in the females but in the male (Fig. 17) the lateral alae flare out as conspicuous vanes which commence at a point, 0.31 mm. from the cloaca, to attain a width of 0.06 mm. and terminate in a broad curve at the point where the tail springs from the body. The tail of the male has the shape of an elongate cone, that is constricted and bent in the middle and is displaced dorsally by the development of a cushion-like cuticular prominence capped by the cloaca. Two pairs of slightly elevated papillae adorn this prominence; one pair on its anterior border and the other at the side, on a level with the cloacal aperture. The posterior lip of the cloaca is guarded by a conspicuous projection that resembles a large median papilla in appearance, but its tip bears a

series of exceedingly minute bosses or blunt spines, making it improbable that the structure is actually a papilla. It is, perhaps, homologous with the structure that has been interpreted as a gubernaculum in *Thelandros sexlabiate* Ortlepp, 1933, and as a median post-cloacal papilla in *Parapharyngodon maplestoni* Chatterji, 1933. In our



Fig. 17. *Thelandros seurati*. Male in ventral view.

specimens there is no trace of the cuticular ctenoid structure that adorns the superior border of the cloaca of several species of *Thelandros* and which has been described in *Pharyngodon mabuyae*. The third pair of caudal papillae is the only one of the three pairs that could be described as pedunculate. It occupies the usual position in the proximal third of the caudal appendage. The spicule is a delicate structure, at least 0.12 mm. in length and about 7μ broad. It is poorly chitinized

and was only detected in one specimen where the rounded distal extremity of the spicule was found protruding from the cloaca.

Most of our female specimens exhibit the phenomenon referred to by Suerat (1914) as "endotokie matricide" wherein the eggs accumulate

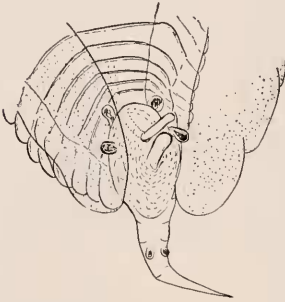


Fig. 18. *Thelandros seurati*. Caudal extremity of male from lateral view.

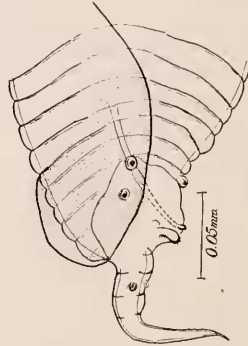


Fig. 19. *Thelandros seurati*. Caudal extremity of male from ventral view.

in the uteri in such numbers that other organs seem to degenerate and the body becomes little more than an egg sac. The excretory vesical and its pore can no longer be made out, and the position of the non-salient vulva, near the middle of the body, can only be detected in a few favorable specimens. There is a glandular vagina, about 0.12 mm. in length followed by a more muscular walled part, the ovejector, of about three times this length. The coils of the uteri extend into the turgid post-anal region of the body; anteriorly the two ovaries are

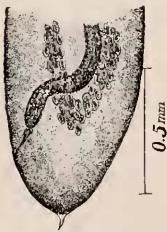


Fig. 20. *Thelandros seurati*. Caudal extremity of female.



Fig. 21. *Thelandros seurati*. Egg with operculum at one pole.

coiled around the prebulbar stem of the oesophagus. The eggs (Fig. 21) are ellipsoidal in shape, with the thick outer shell finely striated and provided with an operculum at one pole.

SYSTEMATIC POSITION OF *Pharyngodon mabuyae* and
Thelandros seurati

The oxyurid parasites of reptiles are a primitive, or at least very specialized, group whose numerous representatives, now separated into about eight genera, show many features in common. Compact as the group is, none of the genera appear to be so closely related as are *Pharyngodon* and *Thelandros*, which are always placed in juxtaposition in comprehensive analytical surveys of the group. That real difficulties are experienced in keeping their constituent species apart is shown by the fact that, when not defined in exactly the same terms, different authors stress different morphological features in diagnosing the genera and separate them by different key characters. Perhaps the most elaborate definitions of these genera are those presented by Seurat (1917) who in a key separates the genera by the following characters:

- (a). Vulva situated immediately behind excretory pore; no vagina; eggs very large; tail of male greatly prolonged. . . . *Pharyngodon*
- (b). Vulva considerably behind excretory pore; distinct vagina present; tail of male in dorsal position. *Thelandros*

Seurat envisages *Thelandros* being derived from *Pharyngodon* by the loss of caudal alae and the concomitant diminution of the peduncle of the first pair of post-anal papillae and of the tail ("point caudale dorsale") in the male. These features, together with the differentiation of a vagina, are to Seurat indicative of the genus *Thelandros* being more highly evolved than *Pharyngodon*.

While the retention of these two genera could be advocated on the score of convenience, our investigation into the matter of the specific relationships of the two species described in this paper indicates that the various described species of *Thelandros* and *Pharyngodon* present a mosaic of characters that cannot be satisfactorily separated into elements sufficiently constant in their association to satisfy the requirements of separate genera. The purposes of taxonomy could probably be better served by treating the group as a single genus, *Pharyngodon*, constituted by two sub-genera:

Pharyngodon Pharyngodon (type; *P.P. spinicauda* (Dujardin)) and
Pharyngodon Thelandros (type; *P.T. alatus* (Wedl)).

The adoption of this procedure would probably check the creation of new monotypic genera that there is a tendency to propose for slightly aberrant species which cannot be fitted into either genus as diagnosed at present.

In *P. spinicauda*, the type species of Pharyngodon, as well as in several other species of the genus, we may recognize the following features as representing the most distinctive generic characters: the presence in the male of a fairly long subulate tail with relatively broad cuticular flanges or caudal alae arising just in front of the cloaca and usually extending far enough backwards to be supported by the post-anal pair of papillae. In the female, the tail is also long and sometimes spinose (*P. extenuatus* Rud.) but the most constant features are: (1) the conspicuous excretory pore, with the vulva contiguous with it and situated anteriorly in the region of the oesophageal bulb; (2) the eggs are large, elongated and provided with opercula at each pole.

Contrasting with this, in *Thelandros alatus*, the type, and in many if not all of the eleven species¹ which have been described in this genus, we find that there are no caudal alae in the male and that the tail proper (point caudale of Seurat) usually takes the form of a short, often spike-like, process that has been shifted dorsally by the massive development of a cuticular protuberance on which the cloacal aperture is situated. In the female the excretory pore is not so conspicuous, and the vulva, though slightly variable in position, is usually situated towards the middle of the body.

From the descriptions of the thirteen species assigned to Pharyngodon, little variation is found affecting the above mentioned generic characters of the female. However, there is a group of species, including *P. laevicauda* (Seurat), *P. extenuatus* (Rud.) *P. tectipenis* Gedoelst and *P. tarentolae* Spaul, in which the caudal alae do not extend sufficiently posteriad to embrace the last pair of papillae, and according to Spaul's key to the genus Pharyngodon, caudal alae are absent in the species *megalocerca* (Skrjabin). This feature is not mentioned in Skrjabin's description though reference to his illustrations supports Spaul's inference.

It therefore appears that among the species of Pharyngodon we can follow the gradual reduction of the caudal alae and we may interpret it as an evolutionary tendency towards the condition found in the various species of *Thelandros*. The special characteristics of the female, more particularly the form of the eggs, are more stable and consequently of greater taxonomic significance. It is mainly for this reason that we have assigned our parasite from *Mabuya varia* to the genus Pharyngodon; otherwise it could be as well accommodated in

¹ I have been unable to confirm these features in *T. oswaldo cruzi* Travassos, 1925 and *T. micruris* Patwardhan, 1935, descriptions of which are not available to me. From Seurat's description it appears that post-cloacal alae are a differential feature of *T. numidicus*.

Thelandros. *P. mabuyae*, is evidently closely related to Skrjabin's *megalocerca*, which also was described from an East African representative of the Geckonidae. From this species, however, it may be distinguished by its general size, the length of the tail in the male and the shape of the lateral alae, etc.

Our species *seurati*, from the skink, *Acontias percivali*, is more typically a member of Thelandros. In the absence of the denticulate, cuticular processes on the anterior border of the cloaca, *seurati* appears to be very closely allied to *T. bulbosus* (v. Linstow). It is also close to *maplestoni*, a species for which Chatterji (1933) created the new, and to my mind, unnecessary, genus *Parapharyngodon*. From both of these species it may be distinguished by the size of its smaller eggs and relatively longer oesophagus as well as on other dimensions.

STRONGYLURIS BREVICAUDATA Müller, 1894

Host: *Heliosciurus rufobrachiatatus nyansae* (Neumann).

Locality: Sipi, Mt. Elgon, Uganda.

In all structural details our specimens, 15 females and 5 males, were indistinguishable from worms in our collection bearing the identification *S. brevicaudata* that were collected in East Africa from species of *Agama* and *Chameleon*. The head, with its three prominent lips is set off by a constriction from the main body and presents the same arrangement of cephalic papillae and amphids as is illustrated by Hsu (1932) for *S. brevicaudata* and by Harwood (1935) for *S. ornata*. The tapering flange of cuticle that projects anteriorly from the inner side of each lip is more prominent in some individuals than in others but this is apparently dependent upon the state of functional contraction at the time of fixation. The cuticle is delicately marked by fine striations, upon which is superimposed a coarser annulation or wrinkling. Commencing just behind the post-cephalic constriction, but not conspicuously forming a cervical ring, and arranged in a double row especially restricted to the dorsal and ventral cuticular fields, is a series of small but prominent papillae with narrow peduncles. These somatic papillae are present in both sexes, and extend at fairly regular intervals to within a short distance of the anus. In the female, the body tapers rapidly behind the anus to form a conical tail that is provided with a pair of prominent caudal papillae and a spike-like terminal appendage. In the male, the posterior end is very abruptly truncated and, obscured from view by the narrow bursa, the sucker, anus and

some of the caudal papillae are difficult to delineate. These organs are best seen by flattening the worm under a cover-glass or examining the cut-off tail in the end-on position. The presence of the usual ten pairs of caudal papillae can then be detected (Fig. 22). Of the three pairs of

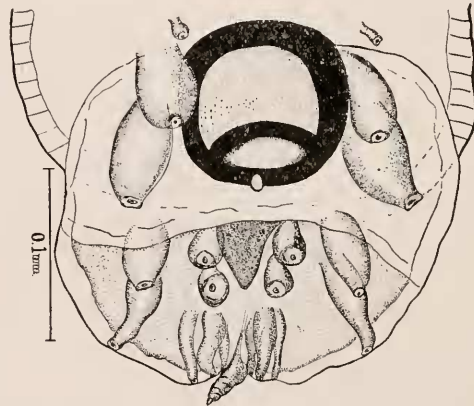


Fig. 22. *Strongyluris brevicaudata* from *Sciurus rufobrachiatus*. Caudal extremity of male; ventral view.

parasuctorial papillae, the first are small and narrow compared with the large, fusiform second and third pairs. The three terminal pairs of papillae are closely set, the largest pair tending to hide one or other of the remaining two pairs so that it may easily be overlooked.

The chief measurements (in millimeters) of the worms are given in the following table:

	Male	Female
Length	8.9 -9.8	9.4 -12.6
Breadth at equator	0.65-0.74	0.7 -0.92
Breadth at cervical constriction	0.77	0.92
Exeret. pore from antr. end.	1.46-1.56	1.77-1.84
Length of pharynx	0.25-0.28	0.27-0.29
Length of esophagus including bulb	1.8 -2.0	2.1 -2.2
Anus to postr. end.	0.084-0.11	0.2 -0.23
Caudal spine	0.040	0.056-.075
Diameter of sucker	0.11-0.13	
Sucker to anus	0.08-0.09	
Spicules (Equal)	1.3 -1.52	
Vulva to postr. end		3.8 -4.7
Eggs		0.072-0.075 x 0.040-.042

DISCUSSION

Prior to the description of *Strongyluris paradoxus* Sandground, 1933, from a glossy ibis, *Hagedashia h. niloticus* from Tanganyika, some ten species of *Strongyluris* had been described. All had been found in lacertilian hosts and consequently the writer held it necessary to consider the possibility of there having been a mix-up of host labels or alternatively that the finding represented an instance of spurious parasitism such as may follow the preying of one animal upon another. However, the evidence surrounding the finding offered no support for such suspicions.

In the present paper we actually extend the host range of the genus *Strongyluris* further. No doubt can here be entertained concerning the authenticity of the host since the writer himself collected the worms from the caecum of the squirrel whose viscera were preserved in the field and brought back in a separate jar. Two additional specimens (♂ & ♀) of a closely related if not identical species of this genus bearing the label "Rat gris, Lac Albert, Congo Belge; Leg. Dr. Fornara," were later given to me by Dr. L. van den Bergh of the Prince Leopold Institute of Tropical Medicine, Antwerp. Hence, there can be no doubt of the genus *Strongyluris* being found in certain African rodents. Concerning the specific identification of the material some question may be raised. On first seeing the worms our first idea was that we were confronted with a new species, but, as subsequent study showed, it is difficult to support this contention. *S. brevicaudata*, the type of the genus, was first recorded from the West African *Agama agama agama* (—*A. colonorum*) and has since been reported from other species of East African *Agama*. Of the thirteen species that are now listed in the genus only two, namely *S. gigas* Spaul and *S. loveridgei* Spaul may be recognized by their significantly larger size. In the absence of other specific criteria, the great variation in length and the proportions of various parts of the body makes the identification of most of the remaining species rather uncertain. Baylis and Daubney (1922) and Spaul (1923) have questioned the validity of several species, while Taylor (1925) contended that *S. ornata* Gendré, and *S. streptocophagus* Connal and probably also *S. chamaeleonis* Baylis and Daubney and *S. calotis* Baylis and Daubney are indistinguishable from the genotype. Recently, however, Harwood (1935) after a scrutiny of the literature and the examination of some of the material in our museum's helminthological collection, has constructed a key to the genus wherein he tentatively reestablishes the validity of all the species

whose standing has come into disrepute. Whether the characters utilized by Harwood are specifically significant need not concern us in considering the status of the species here involved, for not only do its structural features and dimensions coincide for those described for *S. brevicaudata* but prolonged comparison of the specimens with others from various species of *Agama* has failed to reveal a single distinguishing feature. Though one might expect that a lacertilian parasite could not become adapted to a mammal without some accompanying somatic changes, these presumptive morphological differences are so elusive that an identification of *S. brevicaudata* is the only one warranted.

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